



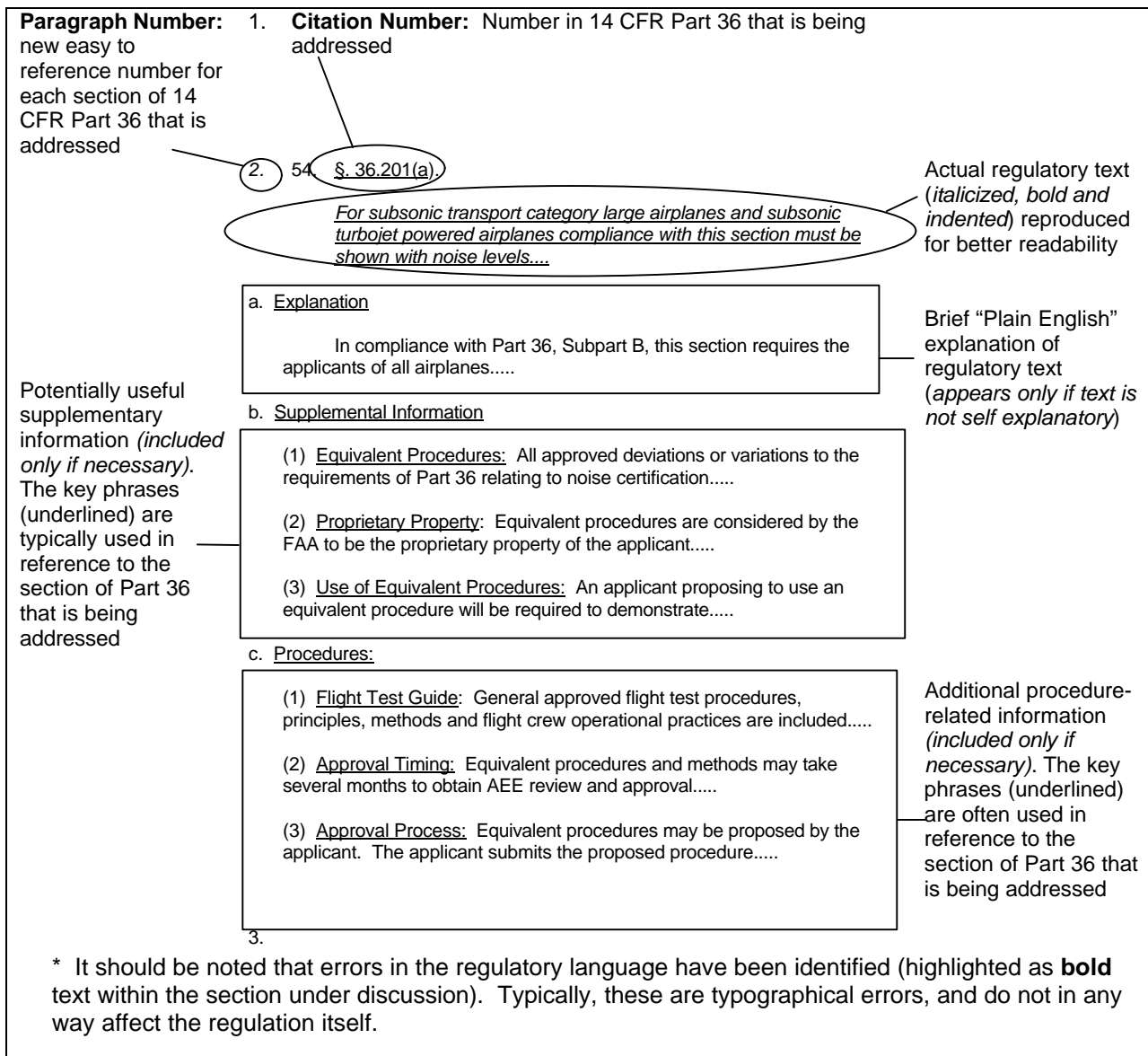
Advisory Circular

U.S. Department of Transportation
**Federal Aviation
Administration**

Subject:	NOISE STANDARDS: AIRCRAFT TYPE AND AIRWORTHINESS CERTIFICATION	Date:	7/31/00	AC No:	DRAFT 36-4C
		Initiated by:	AEE-100	Change:	

1. PURPOSE

- a. Contents: This advisory circular (AC) contains information concerning the standards and requirements for aircraft noise certification and presents explanatory information, as necessary, to identify acceptable means of compliance. The information contained in this document sets forth acceptable means, but not the sole means, by which compliance may be shown with the requirements of 14 CFR Part 36 of the United States Code of Federal Regulations (CFR) Title 14. The regulation that this AC references is 14 CFR Part 36, through Amendment 36-21, dated: December 28, 1995.
- b. Advisory Nature: Like other FAA advisory circulars, the language within this document is intended to be permissive and advisory in nature, except for explanations of regulatory language that are mandatory. In addition, the compliance methods chosen by the applicant are voluntary (i.e., direct compliance methods described in Part 36, proposed equivalent procedure methods, or no acoustical change). Mandatory terms used in this AC, such as “must” and “shall”, are used only in the sense of ensuring the applicability of these particular methods of compliance when the acceptable means of compliance described herein are used. This AC does not change regulatory requirements and does not authorize changes in, or deviations from, regulatory requirements.
- c. Document Format: This AC contains a section-by-section review of the 14 CFR Part 36. In order to assist the user, each of these explanations is provided as separate paragraphs, which are sequentially numbered. In general, each paragraph is presented as follows in Figure 1:

**FIGURE 1: Document Format**

- d. Audience: The intended audience for this AC includes noise specialists from the: FAA (aircraft certification and flight standards), aircraft industry, aircraft certification applicants, foreign governments, airline customers, airport operators, acoustical community, and other interested persons.
- e. AC Intent: The intent of this AC is to establish a clear understanding between the regulatory authorities, aircraft users, local governments, and the aircraft industry of the noise certification processes. It is also intended to present historical policies, guidance material and interpretations that have been used in the aircraft noise certification process. This AC presents acceptable noise certification procedures for normal, utility, acrobatic, and commuter category small airplanes, transport category airplanes and normal and transport category rotorcraft.
- f. Technical Advancement: Since the introduction of noise certification standards on November 18, 1969, the acceptable means and procedures for noise measurement, testing, data reduction, evaluation and compliance reporting have advanced considerably. Applicants use of noise certification and compliance procedural equivalent procedures have been evaluated and approved by the Federal Aviation Administration

(FAA), Office of Environment and Energy (AEE) located in the FAA Headquarters in Washington DC. Many of these equivalent procedures have become acceptable practices and policies and have been identified as such by AEE in memoranda (as well as in the FAA Advisory Circular AC 36-4B, 'Noise Certification Handbook'), to promote uniformity of implementation of the Part 36 noise certification requirements. Where practical, the information and policies contained in AC 36-4B is contained or referenced herein.

g. Exclusions: The following topics are not addressed in this AC:

- This document does not review the noise certification requirements for supersonic transport category airplanes. [Part 36, Subpart D and other related sections of Part 36, address supersonic airplane noise certification requirements only for the Concorde airplane and there currently are no identified procedures for future supersonic planes] Therefore, this AC will not review general supersonic noise certification requirements. The applicant should contact the FAA Office of Environment and Energy for assistance and future plans associated with the noise certification of supersonic transport category airplanes.
- This document does not review Appendix F of 14 CFR Part 36. Appendix F has been superseded by Appendix G.
- This document does not review the aircraft operational limitations that may be imposed on certificated civil aircraft operating within the United States of America, such as is identified in 14 CFR Part 91. An applicant or operator may review the current operational limitations, phased compliance plan requirements, waivers and exemptions, and reporting requirements that are found in the Operating Noise Limits of Part 91, Subpart I, sections 91.801 through 91.875.

- h. 14 CFR Part 36 History: The Table 1-1 below summarizes the date of adoption of Part 36 and all amendments that followed.

Amendment #, Effective Date	Title	Subject
00-0, 12/01/69	Adoption of Part 36	Adds new part 36 to the FAR and makes procedural changes to part 21.

	Approach Noise Test Conditions	Changes the type certification approach noise test conditions for subsonic transport category airplanes and for subsonic turbojet airplanes regardless of category; to ensure that the test is conducted with the same configuration as that used during the airworthiness type certification, and does not result in noise levels less than those that will be generated in normal operation.
36-1, 12/01/69		
36-2, 12/01/73	Noise Standards for Newly Produced Airplanes of Order Type Designs	Require certain new production turbojet and transport category airplanes to comply with part 36, irregardless of type certification date as a condition for issuance of certain standard airworthiness certificates.
36-3, 01/20/75	Acoustical Change Approvals	Tighten the conditions under which applicant must show that issuance of type certificate changes will not increase take-off and sideline noise levels.

36-4, 02/07/75	Noise Standards for Propeller Driven Small Airplanes	Prescribe noise standards for normal, utility, acrobatic, transport, and restricted category type certificates of propeller driven small airplanes; issue of standard airworthiness certificates and restricted category airworthiness certificates for newly produced propeller driven small airplanes of older type designs; prohibit acoustical changes in the type designs that increase noise levels beyond specified limits.
36-5, 09/20/76	Noise Type Certification and Acoustical Change Approvals	Procedures for measuring and evaluating the noise of subsonic transport category turbojet engine powered airplanes; new TCs and acoustical change approvals for which application, is made after September 17, 1971.
36-6, 01/24/77	Noise Regulations for Propeller Driven Small Airplanes Submitted to the FAA by the EPA; and Notice of Decision	Changes procedures to increase the numbers of test flights, modify performance correction formula, and revise noise test engine power; decision not to make other certain EPA recommended amendments.
36-7, 10/01/77	Noise Level Limits and Acoustical Change Requirements for Subsonic Transport Category Large Airplanes and for Subsonic Turbojet Powered Airplanes	Provide for three stages of aircraft noise levels with specified limits, with definitions of classification of airplanes under each stage; applications after November 5, 1975 to be stage 3; prescribe acoustical change requirements for airplanes in each stage.
36-8, 04/03/78	Noise Limits and Acoustical Change Requirements for Subsonic Transport Category Large Airplanes and Turbojet Powered Airplanes	Amend noise limits for new airplane designs; limits noise levels of certain older airplane types if designs are changed; amends noise measuring points and noise test conditions; this amendment complements 36-7 and includes minor modifications to the stage 3 noise limits, and also brings part 36 into greater conformity with ICAO standard.
36-9, 04/03/78	Aircraft Noise Measurement and Evaluation Specification	Updates and clarifies the procedures and standards for conducting certain aircraft noise certification tests, based on developments in the state of the art and on aircraft noise test experience; achieve substantial conformity with modification to ICAO Annex 16.
36-10, 07/31/78	Civil Supersonic Airplanes Noise and Sonic Boom Requirements	Prescribes final rules for SSTs except Concorde with flight time before January 1, 1980; prohibit issuance of standard airworthiness certificates that do not have flight time before January 1, 1980 and that do not comply with part 36; also amends part 21 and part 91 concerning operations of subject airplanes; FAA goal to not certificate or permit to operate any future design SST that does not meet standards then applicable to subsonic airplanes.

36-8, 09/28/78 CORRECTION	(Title): Correction to Minimum Thrust Cutback Altitudes	Prescribe the minimum altitude at which thrust may be reduced during take-off noise tests for certain airplanes powered by turbojet engines with high bypass ratios, which were previously certificated under the stage 2 limits; affects approvals for voluntary changes in type design which might increase the noise levels and is necessary to avoid an unintended effect of Amendment 36-8.
36-9, 01/15/79 CORRECTION	(Title): PNLT Corrections Formula for Ambient Atmosphere Conditions Affecting the Sideline Flight Path	Execute FAA's intended statement of the rule and to prescribe an appropriate correction to the measured noise data when atmospheric conditions do not conform to the prescribed standard reference conditions.
36-11, 11/10/80	Operating Limitations and Related Requirements for Certain Propeller Driven Small Airplanes Designed for Agricultural Aircraft Operations or Fire Fighting Purposes	Provides for certain exclusions from the rule; applies to operation of newly produced airplanes (without flight time before January 1, 1980), and acoustically changed airplanes (without night nine in the changed design before January 1, 1980), that have not been shown to comply with part 36 noise levels; requires that an operating limitation be appropriately provided to the pilot.
36-12, 08/01/81	Noise Levels for Turbojet Engine Powered Airplanes and for Large Propeller Driven Airplanes: Recommended Regulations Submitted to the FAA by the EPA	Adds provision for FAA approval or equivalent procedures; clarifies and simplifies rule language to better explain which noise level requirements apply and which "tradeoff" provisions are available to applicants for approval of modifications to certain, already certificated aircraft type designs; FAA decisions not to prescribe other EPA recommended amendments.
36-13, 02/17/87	Airworthiness Standards and Operating Rules: Commuter Category Airplanes	Amends parts 21, 23, 36, 91, and 135 concerning an additional category of propeller driven, multi engine airplane designated as Commuter Category.
36-14, 2/05/88	Noise Standards for Helicopters in the Normal, Transport and Restricted Categories	Adds noise certification Standards applicable to helicopters; applies to civil helicopters in the nominal, transport and restricted categories and provides noise level limits and test procedures for the issuance of original and amended type certificates; prohibits changes in type design of helicopters that may increase noise levels beyond certain limits; does not limit further manufacture of existing helicopter types; provides commonality with ICAO.
36-15, 05/06/88	Standards Governing the Noise Certification	Revises certain provisions of the 'regulations to make them more understandable and easier to use; simplifies noise certification test and record keeping requirements.

	of Aircraft	
36-16, 12/22/88	Noise Certification Standards for Propeller Driven Small Airplanes	Revises noise certification standard by substituting the use of actual take-off tests for the level flyover tests; revises the noise level limit numbers to approximate the sound levels measured in accordance with Appendix F of part 36; exempts both antique airplanes and airplanes modified by the addition of floats and skis from the acoustical change measurement and documentation requirements of part 21.
36-17, 08/14/89	Noise Standards; Limits on the Growth of Noise from Certain Airplanes and Airplane Types	Ensure that aircraft certificated within certain stages remain within those stages; applies to large transport category aircraft and to turbojet powered aircraft regardless of category and prohibits modification of individual airplanes and whole airplane types which result in increased noise beyond the limits of an airplane's certificated stage; does not restrict changes that result in decreased noise but does prohibit any remodification of an airplane which would return it to its original noise level.
36-18, 08/18/90	Revision of General Operating and Flight Rules	Reorganizes and realigns the rules to make them more understandable and easier to use; provides more flexibility for certain operations.
36-19, 12/31/92	Primary Category	Establishes a new primary category of aircraft and new simplified procedures for type, production, and airworthiness certification, and associated maintenance procedures; maximum certificated weight of no more than 2,700 pounds, a maximum seating capacity of four, and unpressurized cabins.
36-20, 09/11/92	Alternative Noise Certification for Primary, Normal, Transport and Restricted Category Helicopters not Exceeding 6,000 Pounds Maximum Take-off Weight	Adds Appendix J to part 36 providing for an alternative noise certification procedure; new appendix is an optional alternative to the existing helicopter noise requirements and is not an additional regulatory requirement; applicants may demonstrate compliance with either Appendix H or the less costly, but more stringent Appendix J.
36-21, 12/28/95	Authority Citations Revisions	Updates the authority citations listed in Code of Federal Regulations to reference the current law. There are no procedural or technical changes to part 36.
36-22, 10/13/99	Noise Certification Standards for Propeller-Driven Small Airplanes	Harmonizes Appendix G of part 36 with the international standards as issued under International Civil Aviation Organization (ICAO), Annex 16, Volume 1.

2. CANCELLATION

None.

3. REFERENCES

- a. FAA Order 8110.4A, Type Certification Process, May 2, 1995
- b. Advisory Circular (AC) 25-7, Flight Test Guide, April 9, 1986
- c. Advisory Circular (AC) 36-4B, Noise Certification Handbook, March 23, 1988

- d. Society of Automotive Engineers, Inc., Aerospace Recommended Practice, SAE ARP 866A, Standard Values of Atmospheric Absorption as a Function of Temperature and Humidity, revised 3-15-75.
- e. Requirements for DGPS-Based TSPI Systems Used in Aircraft Noise Certification Tests, DTS-75-FA753-LR3, Letter Report, April 14, 1997.
- f. International Civil Aviation Organization (ICAO), Environmental Protection, Annex 16, Volume 1, Aircraft Noise, Third Edition - 1993.
- g. ICAO Committee on Aviation Environmental Protection (CAEP), Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft, Working Group Approved Revision (WGAR) 6, January 1998 (included as Appendix 1 to this AC).
- h. 14 CFR Part 36, Appendix G Handbook, FAA Report FAA-AEE-95, dated June 20, 1995.
- i. FAA Order 8110.37 (current revision). Designated Engineering Representatives (DER) Guidance Handbook.
- j. ICAO Environmental Technical Manual on the use of Procedures in the Noise Certification of Aircraft, Doc 9501-AN/929, Working Groups Approved Revision (WGAR 6), January 1998, that is appended to this AC.

4. DEFINITIONS and ABBREVIATIONS

Section 4a contains regulatory definitions; Section 4b contains technical definitions of phrases that occur in 14 CFR Part 36 and require further explanation; Section 4c contains abbreviations used throughout this AC.

- a. Regulatory Definitions: The following regulatory definitions are used in this AC. These definitions are presented in the indicated US Laws, Code of Federal Regulations, FAA Orders, or FAA Advisory Circulars.
 - (1) Acrobatic Category Airplane: The acrobatic category is limited to airplanes that have a seating configuration, excluding pilot seats, of nine or less, a maximum certificated take-off weight of 12, 500 pounds or less, and intended for use without restrictions, other than those shown to be necessary as a result of required flight tests. Acrobatic category airplanes are required to show compliance with 14 CFR Part 23.
 - (2) Administrator: The Federal Aviation Administrator or any person to whom he has delegated his authority in the matter concerned. (Ref: 14 CFR Part 1)
 - (3) Aircraft: A device that is used or intended to be used for flight in the air. (Ref: 14 CFR Part 1)
 - (4) Aircraft Certification Office (ACO): The (FAA) office that administers the type certificate and production approval of products in the area where the manufacturer is located (Ref: FAA AC 21-6A, dated 7/1/82)
 - (5) Aircraft Engine: An engine that is used, or intended to be used, for propelling aircraft. It includes turbosuperchargers, appurtenances, and accessories necessary for its functioning, but does not include propellers. (Ref: 14 CFR Part 1)
 - (6) Airplane: An engine-driven fixed-wing aircraft heavier than air that is supported in flight by the dynamic reaction of the air against its wings. (Ref: 14 CFR Part 1)
 - (7) Airport: An area of land or water that is used or intended to be used for the landing and take-off of aircraft, and includes its buildings and facilities, if any. (Ref: 14 CFR Part 1)
 - (8) Approved Data: Data used to approve major repairs and major alterations, including the following:

- Type Certificate Data Sheets;
- Supplemental Type Certificates (STC's);
- Airworthiness Directives;
- Manufacturer's FAA approved data;
- Designated Engineering Representative (DER) approved data;
- Designated Alteration Station (DAS) approved data developed for alterations performed by the station only.

(Ref: FAA Order 8300.10, Chg 1, dated 7/21/89)

- (9) Bilateral Airworthiness Agreement (BAA): A government-to-government executive agreement between the US and the government of another country to facilitate the airworthiness approval or acceptance of civil aeronautical products exported from one country to the other. BAA's are not trade agreements, rather they are technical cooperation agreements, intended to provide a framework for the airworthiness authority of the importing State to give maximum practicable credit to airworthiness certification functions performed by the airworthiness authority of the exporting State using its own domestic certification system (Ref: FAA AC 21-23, dated 7/7/87).
- (10) Civil Aircraft: Aircraft other than a public aircraft (Ref: 14 CFR Part 1)
- (11) Commuter Category Airplanes: The commuter category is limited to propeller-driven, multiengine airplanes that have a seating configuration, excluding pilot seats, of 19 or less, and a maximum certificated take-off weight of 19,000 pounds or less, intended for nonacrobatic operations. Commuter category airplanes are required to show compliance with 14 CFR Part 23.
- (12) Data: Information that supports and/or describes the alteration or repair, including the following:
- Drawings, sketches, and/or photographs;
 - Stress analysis;
 - Engineering Orders;
 - Operating limitations.
- (Ref: FAA Order 8300.10, Chg 1, dated 7/21/89)
- (13) Decibel (dB): The unit in which the relative levels of intensity of acoustical quantities, such as sound pressure levels, noise levels and power levels, are expressed on a scale from zero (for the average least perceptible level) to about 130 for the average threshold of pain. (Ref: FAA AC 20-133, dated 3/22/89).
- (14) FAA: Federal Aviation Administration.
- (15) Frequency (Hz): The number of oscillations per second of a sine wave of sound (Ref: FAA AC 20-133, dated 3/22/89).
- (16) Helicopter: A rotorcraft that, for its horizontal motion, depends principally on its engine-driven rotors. (Ref: 14 CFR Part 1)
- (17) Major Alteration: An alteration not listed in the aircraft, aircraft engine, or propeller specifications that:
- Might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness.
 - Is not done according to accepted practices or cannot be done by elementary operations.

(Ref: FAA Order 8300.10, Chg 1, dated 7/21/89)

- (18) Minor Alteration: Any alteration that is not classified as a major alteration (Ref: FAA Order 8300.10, Chg 1, dated 7/21/89)
 - (19) Noise: Any sound which is undesirable because it interferes with speech and hearing (Ref: FAA AC 20-133, dated 3/22/89).
 - (20) Noise Spectra: The description of noise sound waves by resolution of their components, each of different frequency and (usually) different amplitude and phase (Ref: FAA AC 20-133, dated 3/22/89).
 - (21) Octave Band: All of the components, in a sound spectrum, whose frequencies are between two sine wave (pure tone) components whose ratio of frequencies is exactly two, i.e. separated by an octave (Ref: FAA AC 20-133, dated 3/22/89).
 - (22) Person: An individual, firm, partnership, corporation, company, association, joint-stock association, or government entity. It includes a trustee, receiver, assignee, or similar representative of any of them. (Ref: 14 CFR Part 1)
 - (23) Primary Category Aircraft: A primary category aircraft is an aircraft that (i) is unpowered, or is an airplane powered by a single, naturally aspirated engine with a 61-knot or less stall speed, or is a rotorcraft with a 6-pound per square foot main rotor disc loading limitations, and (ii) weighs not more than 2,700 pounds, and (iii) has a maximum seating capacity of not more than four persons, including the pilot, and (iv) has an unpressurized cabin. A primary category aircraft is required to meet the regulatory requirements of 14 CFR Part 21.24.
 - (24) Propeller: A device for propelling an aircraft that has blades on an engine-driven shaft and that, when rotated, produces by its action on the air, a thrust approximately perpendicular to its plane of rotation. It includes control components normally supplied by its manufacturer, but does not include main and auxiliary rotors or rotating airfoils of engines. (Ref: 14 CFR Part 1)
 - (25) Public Aircraft: Aircraft used only in the service of a government, or a political subdivision. It does not include any government-owned aircraft engaged in carrying persons or property for commercial purposes. (Ref: 14 CFR Part 1)
 - (26) Rotorcraft: A heavier-than-air aircraft that depends principally for its support in flight on the lift generated by one or more rotors (Ref: 14 CFR Part 1).
 - (27) Small Aircraft: Small aircraft means aircraft of 12,500 pounds or less, maximum certificated take-off weight.
 - (28) Subsonic airplane: A subsonic airplane means an airplane for which the maximum operating limit speed, M_{MO} , does not exceed a Mach number of 1.
 - (29) Supersonic airplane: A supersonic airplane means an airplane for which the maximum operating limit speed, M_{MO} , exceeds a Mach number of 1.
 - (30) Utility Category Airplane: The utility category is limited to airplanes that have a seating configuration, excluding pilot seats, of nine or less, a maximum certificated take-off weight of 12,500 pounds or less, and intended for limited acrobatic operation. Utility category airplanes are required to show compliance with 14 CFR Part 23.
- b. Technical Definitions: The following technical definitions are used in this AC. These definitions, although not directly defined in published regulations, are used in the acoustical field or referred to in certification regulations.

- (1) A-weighted Sound Level (dB (A)): A single event sound level which has been filtered or weighted to discriminate against the low and high frequency extremes to approximate the auditory sensitivity of the human ear.
- (2) Acoustical change: Any approved change to the aircraft type design that would increase any certificated noise level of the aircraft is defined to be an acoustical change. These changes include any permanent (see § 36.1(c) discussion for classification of changes in type design and the limitations presented in § 21.93(b)) hardware changes (including changes to or removal of noise control components) and any changes to the operational limitations (including changes to approved maximum operational gross weights or operational configuration limitations, etc.) that would increase a certificated noise level of the aircraft as presented in the approved Airplane or Rotorcraft Flight Manual for the changed configuration.
- (3) Aircraft Certification Office (ACO): The geographically responsible (local) ACO within the applicant's jurisdiction to which the certification is submitted.
- (4) Airplane Flight Manual (AFM) or Rotorcraft (RFM): The FAA approved Airplane (or Rotorcraft) Flight Manual for aircraft as defined in 36.1501.
- (5) Ambient Noise: Local ambient noise produced around the microphone location that may be caused by wind, traffic, machinery, local activities, etc. Ambient noise tends to vary constantly and should be measured frequently (i.e., before and after each test measurement).
- (6) Anomalous Winds: Abnormal winds aloft caused by terrain, turbulence, cloud formations, rising heated air, descending cooled air, wind shears, etc., that affect the airplane flight path, that may be of irregular direction and exceptionally high in velocity but that may not be measured at the 10 meter meteorological station in the vicinity of the microphones.
- (7) Applicant: 14 CFR Part 21.13, states: "Any interested person may apply for a type certificate". The person that applies to the FAA for an aircraft type certificate, whether a new (original), amended, supplemental or provisional type certificate, is identified as the "applicant" and is to comply with the procedural, certification and production requirements of 14 CFR Part 21.
- (8) Atmospheric Absorption Coefficient: The atmospheric absorption coefficient, α , is the numerical sum of the classical absorption coefficient and the molecular absorption coefficient, expressed in units of dB/1000 ft. See ARP 866A, Standard Values of Atmospheric Absorption as a Function of Temperature and Humidity, (Ref. 3.d.) for additional information.
- (9) Background Noise: The energy summation of ambient noise and instrumentation noise. Background noise varies with time and should be evaluated before and after each test measurement or condition.
- (10) Bilateral Aviation Safety Agreement (BASA): A recently implemented "Executive Agreement" similar to the old BAA (but similar in content for all countries) that is concluded at the government-to-government level by an exchange of Department of State diplomatic notes. The purpose of the BASA is to provide for technical cooperation between the FAA and the counterpart aircraft certification authority and to facilitate reciprocal airworthiness certification of civil aeronautical products between the two countries. The primary difference between a BAA and the new BASA is that the BASA contains "Implementation Procedures" (IP) that identify explicit details for aircraft airworthiness certification, aircraft maintenance requirements, flight simulators, environmental testing, etc. Implementation Procedures are co-developed and signed by the FAA and the other civil aviation authority. At present, no Advisory Circular exists that provides details on the content of a BASA. Interested parties should contact the FAA International Airworthiness Programs Officer (AIR-4) at FAA National Headquarters, 800 Independence Ave., S.W., Washington, DC 20591 for additional details.
- (11) Configuration: The hardware type design, aerodynamic controls position (including flap position), normal system operations (including air conditioning system and APU operation), engine power settings, inter-

compressor bleed valve schedules, and limiting gross weights (as identified in the “Limitation” section of the approved flight manual). Operation of emergency equipment, such as air-driven electrical generators and hydraulic pumps, are not considered a hardware change for noise certification purposes.

- (12) Cutback Power: The greater of: a) all engine operating at 4% climb gradient power level or b) “one-engine out level” flight power level requirements at the appropriate altitude and airspeed.
- (13) Equivalent Procedures: Equivalent procedures are alternative methods used to satisfy the regulatory requirements. FAA approved equivalent procedures are those procedures, which are shown to yield the same noise levels as if the specified Part 36 test or analyses were fully performed as, prescribed.
- (14) Flight Path: The allowable airplane take-off or approach test flight path within the pre-approved altitude and lateral deviations and within the “10 dB-down” period noise measurements.
- (15) Flight Path Intercept: A testing procedure by which the airplane remains airborne throughout a series of test runs. Each test run is conducted at stabilized power, altitude, speed and configuration conditions, and the airplane conducts a go-around following each test run condition to set-up for the next test run.
- (16) Hard-guard: A physically hard and restrictive installation (such as a screwed, bolted, riveted, or welded shield) that is installed to physically prohibit the selection of greater than limiting operations/configurations, such as limiting flap settings that may have been established as a result of compliance with the noise limits of this part.
- (17) Instrumentation Noise: The electrical noise of the measuring equipment is determined by the quality of the equipment utilized by the applicant and includes minimum microphone frequency dependent response levels, microphone pre-amplification equipment noise, microphone cable (line), recording equipment electrical noise, etc. The equipment electrical noise is typically greatest at high frequencies.
- (18) Large Aircraft: Large aircraft means aircraft of more than 12,500 pounds, maximum certificated take-off weight.
- (19) Layered Atmosphere: A convenient division of the atmosphere in layers from the surface to the highest aircraft altitude within the interval described by 10 dB - down time, (each layer not to exceed 100 feet in height), to more accurately describe and account for atmospheric attenuation.
- (20) No Acoustical Change: A no acoustical change may be any approved voluntary change to the aircraft type design that would cause or effect an increase (of less than +0.10 dB) or decrease to any noise level of the aircraft under certification conditions but the noise levels are not presented in the approved flight manual (AFM or RFM) for that configuration. The applicant accepts the noise levels of the pre-change configuration in the approved flight manual for the new revised configuration. These changes include:
 - Any permanent hardware change [see Section 36.2(b) discussion of classification of changes in type design and the limitations presented in Section 21.93(b)], and
 - Any change to the operational limitations (including changes to approved maximum operational gross weights or operational configuration limitations, etc.) that would increase (by less than +0.10 dB) or decrease any of the three (take-off, flyover/sideline or approach) certificated noise levels of the aircraft as presented in the approved flight manual.

For NACs, the applicant may not obtain FAA noise level certification approval. NACs are to be evaluated at each of the measurement points (that is, “tradeoffs” are not permitted between measurement points).

- (21) Noise Certification Specialist (NCS): The Directorate (Transport, Small Airplane, or Helicopter) Noise Certification Specialist.

- (22) Noise level: Any FAA approved aircraft noise value measured, analyzed, approved, and reported under the certification requirements of 14 CFR Part 36.
- (23) Noise limit: Any limiting noise value identified in 14 CFR Part 36 (Appendix C for transport category and turbojet powered airplanes, Appendix F & G for propeller-driven small airplanes and propeller-driven, commuter category airplanes, and Appendix H & J for helicopters).
- (24) Noise Power Distance (NPD): An evaluation method of flight test noise data that permits extended Noise evaluation in terms of Power (engine power setting parameter) and Distance (height above the microphone).
- (25) Normal Category Airplane: The normal category is limited to airplanes that have a seating configuration, excluding pilot seats, of nine or less, a maximum certificated take-off weight of 12,500 pounds or less, and intended for nonacrobatic operation. Normal category airplanes are required to show compliance with 14 CFR Part 23.
- (26) Normal Category Rotorcraft: A normal category rotorcraft is a rotorcraft with maximum weights of 6,000 pounds or less and that meets the regulatory requirements of 14 CFR Part 27.
- (27) Soft-guard: A restrictive mechanical device that is installed to prohibit the use of greater than limiting operational configurations, such as limiting flap settings that may have been established as a result of compliance with the noise limits of this part. In case of a declared emergency, the soft-guard may be broken and thus permit the application of operational configurations for safety purposes.
- (28) Spool-down Time: The time and character of engine rotor speed (usually corrected N1, rpm) deceleration from a stabilized full take-off power level to a reduced cutback power level following appropriate pilot recognition time and throttle movement time.
- (29) Supplemental Noise Information: Information in addition to the certificated compliance noise level information. Supplemental flight manual noise information includes noise for take-off, flyover/sideline and approach for configurations other than that used for the maximum noise levels associated with the maximum or limiting certificated configuration that was used to show compliance with Part 36.
- (30) 10 dB-Down Period: That portion of the aircraft flyover when the measured noise level is within 10 dB of PNLTM, i.e., the period to be used for the calculation of EPNL. This is often interchangeably referred to as the "PNLTM – 10 dB Period".
- (31) Trade-offs: Noise level values that may be used in calculating compliance with the certification noise limits for transport category, turbojet powered airplanes and helicopters. Within the limitations of Appendices C & H (see: C36.5 (b) and H36.305 (b)), levels which exceed the prescribed noise limits at one or two of the noise measuring points are permitted to be "traded" if they can be completely offset by reduced noise levels at the remaining points (i.e., the total noise level for the three measuring points does not exceed the total noise limit of the three measuring points).
- (32) Transport Category Aircraft: Those aircraft (large or small) that are demonstrated to meet and are certificated to the regulatory requirements of 14 CFR Part 25 for transport category airplanes or 14 CFR Part 29 for transport category rotorcraft.
- (33) Type Inspection Authorization (TIA): The TIA is the official FAA document that provides direction and communication between the local ACO engineering group and the FAA flight test crew. The TIA usually contains the applicant's Plan of Test and any additional restrictions, inspections, tests, limitations, procedures, etc., that are required by the ACO to be observed during the conduct of the flight or ground testing.

- (34) Turbojet Powered Airplane: Any fixed wing airplane that is powered by a turbojet engine regardless of whether it is an airplane certificated to Part 23 (small or commuter aircraft) or Part 25 (transport category aircraft).
- (35) Voluntary Change: A willing and deliberate certificated change by the applicant in the aircraft type design configuration, for noise reduction or other purposes, not mandated by the FAA (i.e., Part 39, Airworthiness Directives). Mandatory Part 39 changes to an aircraft are not noise certificated by the FAA.

c. Abbreviations: The following abbreviations are used throughout this AC:

AC	= FAA Advisory Circular
A/C	= Air-conditioning (Environmental Control System)
ACO	= Local FAA Aircraft Certification Office
AEE	= FAA Office of Environment and Energy
AFM	= Airplane Flight Manual
ANM	= FAA Office of Northwest Mountain Region
APP	= Approach
APU	= Auxiliary Power Unit
ARP	= Aerospace Recommended Practice
BAA	= Bilateral Airworthiness Agreement
BASA	= Bilateral Aviation Safety Agreement
CDI	= Course Deviation Indicator
CG	= Center of Gravity
CI	= Confidence Interval (90%)
CFR	= Code of Federal Regulations
cps	= cycles per second (hertz)
dB	= decibels
DER	= Designated Engineering Representative (Acoustical)
DGPS	= Differential Global Position System
DMU	= Distance Measuring Unit
EPNL	= Effective Perceived Noise Level, EPNdB
EPR	= Engine Pressure Ratio (Power Setting Parameter)
FAA	= Federal Aviation Administration
FAR	= Federal Aviation Regulation (CFR Title 14)
FCAA	= Foreign Civil Aviation Authority
FPR	= Fan Pressure Ratio
GDI	= Glide-slope Deviation Indicator
GPS	= Global Positioning System
Hz	= oscillatory frequency, cycles per second
INS	= Inertial Navigation System
ICAO	= International Civil Aviation Organization
ILS	= Instrument Landing System
IP	= Implementation Procedures (for BASA)
ISA	= International Std. Atmosphere
JAA	= Joint Airworthiness Authorities (of Europe)
JAR	= Joint Airworthiness Requirements (of Europe)
KEAS	= Aircraft Equivalent Airspeed, Knots
KIAS	= Aircraft Indicated Airspeed, Knots
LASmx	= Maximum A-weighted sound level with slow exponential time weighting
Log	= logarithmic value to base 10
m	= meter
M	= Mach number
met	= meteorological
MLW	= Maximum Landing Weight, lb.
MOA	= Memorandum of Agreement

MSL	= Mean Sea Level altitude, feet
MTOGW	= Maximum Take-off Gross Weight, lb.
N1	= Low Pressure Rotor Speed (Power Setting Parameter), rpm or %
N/A	= Not Applicable
NAC	= No Acoustical Change
NCA	= Noise Control Act of 1972
NCS	= Noise Certification Specialist
NIST	= National Institute of Standards and Technology
NPD	= Noise-Power-Distance
PNL	= Perceived Noise Level, dB
PNLT	= Perceived Noise Level (Tone corrected), dB
PNLTM	= Maximum PNLT, dB
Ref.	= Reference
RFM	= Rotorcraft Flight Manual
RH	= Relative Humidity, %
rms	= root-mean-square
RD	= Rotorcraft Directorate
rpm	= revolutions per minute
SAE	= Society of Automotive Engineers
SBV	= Surge Bleed Valve (engine internal operating valves)
SAD	= Small Airplane Directorate
S/L	= Sideline (flyover)
SPL	= Sound Pressure Level, dB
sps	= Samples per second
STC	= Supplemental Type Certificate
TAD	= Transport Airplane Directorate
TIA	= Type Inspection Authorization
TIP	= Test Item Planning document
TC	= Type Certificate
TM	= Technical Manual ("ICAO Environmental Technical Manual on the use of Procedures in the Noise Certification of Aircraft")
TO	= Take-off
TSPI	= Time Space Positional Information
V _s	= Airplane Stall Velocity, knots
V _{s1g}	= Airplane Stall Velocity at 1.0 g, knots
1.3V _s	= Airplane Reference Velocity, knots
VNTSC	= Volpe National Transportation System Center (DOT)

5. - 7. RESERVED

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I. CERTIFICATION PROCEDURES FOR PRODUCT AND PARTS 14 CFR PART 21

8. PART 21 - GENERAL

As part of the overall aircraft certification requirements identified in 14 CFR Part 21, the noise certification requirements of Part 36 are to be met. To paraphrase the certification regulations: An applicant for a type certificate must show that the aircraft meets the applicable requirements of Part 36 (Part 21.17). In addition, an applicant is entitled to a type certificate for an aircraft if the applicant submits the type design, test reports, and computations necessary to show that the product to be certificated meets the applicable airworthiness and aircraft noise requirements (Part 21.21 & 21.25). Similar requirements are imposed for aircraft manufactured in a foreign country for import into the United States (Part 21.29). Refer to the 14 CFR Part 21 regulations for specific additional instructions and information.

a. Supplemental Information

- (1) Airworthiness Certification: All aircraft requiring noise certification by the FAA are required to meet the applicable airworthiness requirements of 14 CFR Part 21 which identifies the specific airworthiness standards for each aircraft type and product, such as:
 - Part 23 for normal, utility, acrobatic, and commuter category airplanes,
 - Part 25 for transport category airplanes,
 - Part 27 for normal category rotorcraft,
 - Part 29 for transport category rotorcraft,
 - Part 33 for aircraft engines,
 - Part 35 for propellers,
 - Primary category aircraft, and
 - JAR-VLA aircraft.
- (2) Type Design. To paraphrase the certification requirements: the type design (as identified in Part 21.31) consists of any data necessary to allow, by comparison, the determination of the airworthiness and noise characteristics of later products of the same type.
- (3) Changes in Type Design. 14 CFR Part 21.93(b) identifies the acoustical change provisions that must be met for voluntary type design changes by an applicant. See paragraph 24 of this AC for further discussion relative to acoustical changes for transport category airplanes, turbojet powered airplanes (regardless of category), and helicopters.

9.-11. [RESERVED]